REMARKS

Claims 1-32 were pending. Claims 1, 3-6, 9-10, 12-13, and 15-32 are amended herein. Accordingly, claims 1-32 remain active in the application. Reconsideration and allowance of the present application is respectfully requested in light of the amendments and the following remarks.

As a preliminary matter, Applicant desires to call to the Examiner's attention that prosecution of the present application has been assigned to new counsel and the prior Power of Attorney has been revoked. Applicant respectfully requests that all correspondence and inquiries be directed to the undersigned. New counsel has reviewed the specification, claims, and drawings, and submits herewith amendments to correct typographical and other minor errors, as explained below.

Drawing Changes

Applicant submits herewith Annotated Marked-up Drawings for the Examiner's approval, containing proposed drawing corrections, and proposed Replacement Sheets for drawing sheets 5 and 6.

Paragraph 42 of the specification refers to a reference resistor 280, but the resistor in Figure 7 was unnumbered. Applicant proposes adding a reference number 280 and lead line to Figure 7.

In Figure 8, Applicant proposes modifying elements 305 and 310 to conform to the description in the specification. Paragraph 43 describes that "MTJ devices 307 and 308 have their magnetic fields set to be parallel." Applicant proposes modifying the appearance of MTJ devices 307 and 309 to agree with Figure 10d MTJ devices 205 and 210, showing parallel magnetic fields. Further, paragraph 46 describes that "MTJ devices 312 and 314 have their magnetic fields set to be such that the MTJ device 312 is parallel and the MTJ device 314 is anti-parallel." Applicant proposes modifying the appearance of MTJ devices 312 and 314 to agree with Figure 10c MTJ devices 205 and 210, showing parallel and anti-parallel magnetic fields, respectively. Further, it is proposed that the caption on MTJ 312 be amended to correct a typographical error and place it in agreement with Figure 10c—the caption R_{1_MAX} should correctly read R_{1_MIN}, as shown in Figure 10c and described in paragraph 37. No new matter is

included in the proposed drawing corrections. Applicant respectfully requests approval of the proposed drawing changes.

Amendments to the Specification

Applicant has amended various paragraphs of the specification to correct minor errors. Most of these errors are typographical or grammatical, and will not be commented on further. Several, however, warrant further explanation.

First, the formula in paragraph 38 has been corrected, as it erroneously inverts the expression for the parallel resistance of resistive elements 205 and 210. Those of ordinary skill in the art are familiar with the proper expression for combining parallel resistance values and should readily recognize this error—the correction of this common expression in the formula of paragraph 38 is therefore not viewed as the addition of new matter.

In paragraphs 42 and 43, references to Figures 7 and 8 were apparently inadvertently switched. This is evident from inspection of the elements referred to in these paragraphs.

In paragraph 46, it is incorrectly stated that making the magnetic field of MTJ device 312 parallel makes the resistance level of MTJ device 312 at its maximum value, and making the magnetic field of MTJ device 314 anti-parallel makes the resistance level of MTJ device 314 at its minimum value. As explained in Figure 10c and paragraph 37, the opposite is true. Appropriate corrections have been made to paragraph 46.

Applicant respectfully submits that no new matter has been added by the amendments to the specification, and requests that the amendments be entered.

Claim Amendments

The claims have been amended to correct the informalities noted by the Examiner, as well as several other informalities.

Claims 5, 13, and 21 contained an apparently typographical error that rendered them nonsensical, e.g., resistive elements were biased at a constant voltage to produce a resultant voltage. It is evident that what was intended was an analog of claim 4 wherein resistive elements were biased at a constant current to produce a resultant voltage. This concept is included in the original description found in paragraph 54. Claims 4 and 5 have both been amended to correct

this error and at the same time place the subject matter for claim 4 next to its dependent claim 6. Similar corrections have been made to claims 12 and 13 and claims 20 and 21—these corrections also serve to correct an incorrect reference to a parent claim.

Several of the claims run into difficulty when applying the language of claims 1-8 to multiple reference level generation. Claims 9, 14-17, 19, 22-25, 27-29, and 31-32 have been amended in the hopes of clarifying the applicable language and providing proper, unambiguous antecedent basis for each claim element. Applicant referred to the Figures in making these changes, and it is believed that each amended claim in this group is supported by at least one illustrated embodiment.

Claims 10, 18, 19, 26, and 30 have been amended to alleviate the confusion evident in their original language, e.g., as to every resistive element having a different resistance, when it is clear from the description that the resistive elements do not all have different resistances.

Response to Rejections

Claims 1-8

Original claims 1-8 were rejected under 35 U.S.C. § 103(a) as obvious over Tran in view of Takai. Applicant respectfully traverses this rejection and submits that the combination of Tran and Takai fails to create a *prima facie* case of obviousness for any of the rejected claims.

Tran Figure 1 contains two reference cell rows 110 and 112, with the cells in one of the rows set to logic "0" and the cells in the other row set to logic "1". (Tran, col. 3, ll. 19-23.) A sense voltage Vs is applied across one cell 104 in each row 110 and 112 (Tran is unclear as to how Vs appears across the cells, as he describes applying Vs to a word line) to create reference currents Ira and Irb in reference bit lines 128 and 130. (Tran, col. 4, ll. 17-32.) The two reference currents Ira and Irb are combined by hardwiring at the reference input of a half-gain amplifier 126, which apparently drives coupled bit lines 128 and 130 to a ground potential to sink currents Ira and Irb (Ira and Irb are proportional to Vs). (Tran, col. 4, ll. 26-39.) Tran's motivation is to subject reference cells to the same variables and measurement process as the selected memory cells to increase sensing performance. (Tran, col. 4, ll. 44-64.)

Regrettably, no translation of the Takai reference is provided. The Examiner asserts from Takai Figure 1 that a first mirror source is in communication with a first resistive element and

provides a first mirrored replication, and a second mirror source is in communication with a second resistive element and provides a second mirrored replication, and then combines the mirrored replications. The Examiner asserts that the "first and the second mirrored replications [] represent currents with different characteristics," but this is not apparent from the Figure and therefore Applicant does not agree with this statement. The Examiner also has not shown the intended purpose of Takai Figure 1, which shows a single external terminal at the source terminal of tail transistor 9 and apparently no input terminals. Therefore Applicant is unable to ascertain whether Takai Figure 1 is taken from an analogous art or not.

Several important issues arise with Takai. First, there is no indication that Takai's resistors 20 and 21 could be nonlinear resistive elements. Second, Takai's circuit does not appear to bias his resistors at a constant level to impart a first resultant level from the resistors, as claimed.

The rejection asserts that:

> Since the use of current mirrors as current sources was common and well known in the art (as exemplified by Takai), it would have been obvious at the time the invention was made to a person having ordinary skill in the art to include current mirrors (as in Takai) in the reference generator of Tran to provide the reference currents, for the purpose of generating more stable and reliable reference currents indicative of the states of the reference cells.

To create a *prima facie* case of obviousness, the motivation or suggestion to combine the references must be found in the prior art. The motivation asserted in the rejection, on the other hand, appears to be based on impermissible hindsight and not on any teaching of the references. *See* MPEP 2143.01. The prior art of record does not teach that the circuit of Takai allows the generation of more stable and reliable reference currents indicative of the states of the reference cells in a nonlinear resistive element reference generator.

Delving deeper, even the motivation suggested by the Examiner fails to suggest to one of ordinary skill in the art to combine Takai and Tran to produce a circuit as claimed by Applicant. Applicant's claim 1 requires, for instance, "a first nonlinear resistive element biased at a constant level to impart a first resultant level from said first resistive element" and "a first mirror source in communication with the first nonlinear resistive element to receive the first resultant level and provide a first mirrored replication of said first resultant level." The combination of the

references fails to suggest combining the references in a manner that meets both of these claim requirements. Tran apparently accomplishes the first requirement by connecting one end of his nonlinear resistive elements to an input of his amplifier 126 that is driven to a stable (ground) reference and the other end of the resistive elements to another stable reference Vs. On the other hand, Takai's resistors do not appear to exist in such an environment that biases the resistors at a constant level. Merely interposing Takai's circuit in Tran's circuit would therefore not create a constant level biasing of the nonlinear resistive elements. Thus the prior art fails to teach or suggest combining Tran and Takai in a manner that satisfies both recited claim limitations—biasing the first nonlinear resistive element at a constant level to impart a first resultant level and mirroring the resultant level.

Finally, it would not be obvious to interpose Takai's circuit in Tran's circuit because Tran's main motivation is to treat reference cells like sensed cells are treated, and this main motivation cannot be met using a circuit that treats the reference cells differently.

Regarding claim 3, "multilevel" has been clarified, as supported in the specification, to refer to embodiments where a multilevel MTJ comprises multiple MTJs with selected magnetic orientations. Tran and Takai fail to suggest a reference generator using such multilevel MTJs.

Claims 4 and 5 have been swapped and claim 4 has been amended as discussed in the preceding section. The Examiner asserted that it would be obvious to convert current levels to voltages. But that is not what is claimed in (now) claim 4. Rather, claim 4 recites that the nonlinear resistive elements are biased at a constant current to impart resultant voltages, which are then mirrored. This is not a conversion from current to voltage, but a different sensing method, not suggested by the references.

Claims 9-32

Claims 9-32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tran in view of Takai as applied to claims 1-8, and further in view of Naji. Applicant respectfully submits that a *prima facie* case of obviousness is lacking for each of claims 9-32, as Naji does nothing to diminish the arguments presented above for the patentability of claims 1-8.

Conclusion

For the foregoing reasons, Applicant respectfully requests allowance of claims 1-32 as presently constituted. The Examiner is encouraged to telephone the undersigned at 512.867.8502 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

James E. Harris
Reg. No. 40,013

Date: May 6, 2005

HAYNES AND BOONE, LLP
901 Main Street, Suite 3100
Dallas, Texas 75202-3789
Telephone: 512.867.8502
Facsimile: 512.867.8663
Customer Number: 42717

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date indicated below:

Susan C. Lien

5/6/05
Date

In the Drawings:

Annotated Marked-up Drawings and proposed Replacement Sheets are submitted herewith for original drawing sheets 5 and 6.

Annotated Marked-Up Drawing
for Examiner's Approval

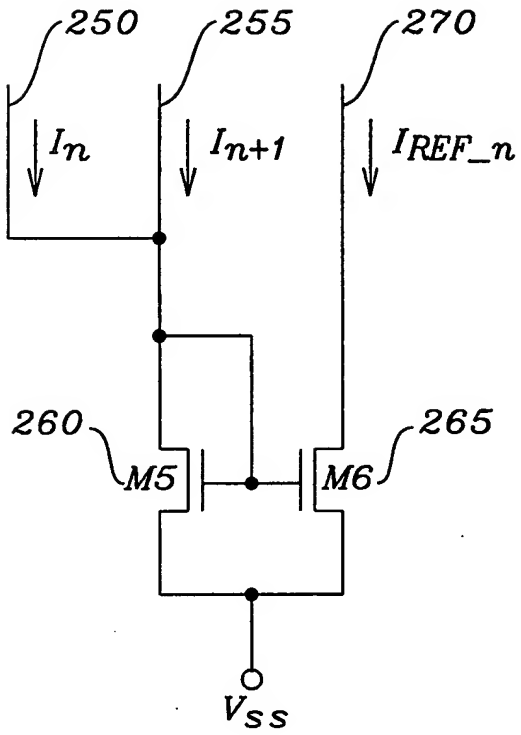

FIG. 6

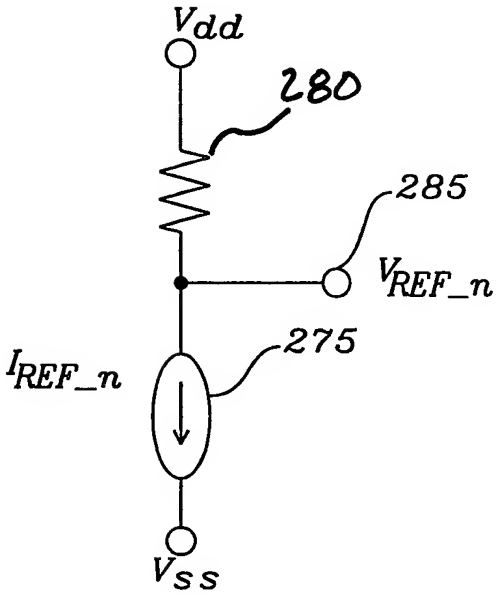

FIG. 7

Annotated Marked-Up Drawing
for Examiner's Approval

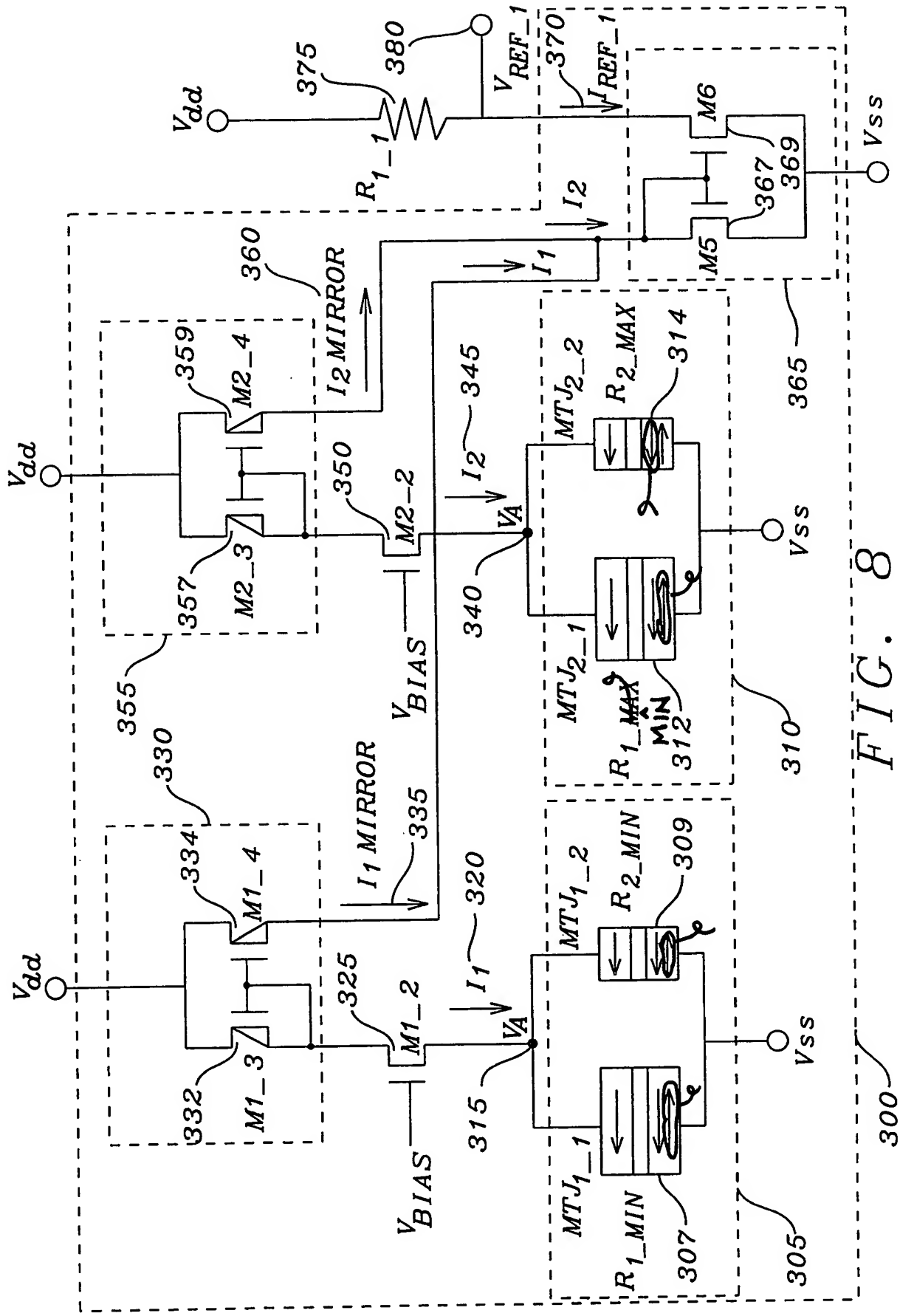

FIG. 8